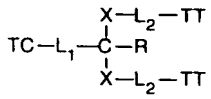
CLAIMS

1. A dendron, having, as a recurring unit of each branch, a structure represented by formula (I):

Formula (I)



wherein TC designates a linkage to a former generation in the direction to a focal point of the dendron; TT's each designate a linkage to a next generation in the direction to a terminal of the dendron; X represents a divalent group comprised of at least one heteroatom; L_1 and L_2's each independently represent a divalent linking group; R represents a hydrogen atom or a substituent; and in the recurring units, X's may be the same or different, R's may be the same or different, L_1's may be the same or different, and L_2's may be the same or different.

2. The dendron according to claim 1, wherein the divalent group represented by X in formula (I) is -S-, -SO-, or $-SO_2-$.

3. The dendron according to claim 1, wherein the divalent group represented by X in formula (I) is -S-.

4. The dendron according to claim 1, wherein, in formula (I), L_1 and L_2 each independently represent a mere single bond, an alkylene group, an alkenylene group, an alkynylene group, a cycloalkylene group, an arylene group, a heteroarylene group, -O-, -S-, $-P=O(R_1)-$, $-N(R_1)-$, -CO-, -SO-, $-SO_2-$, $-Si(R_1)(R_2)-$, or combination thereof, each of which may have a substituent, in which R_1 and R_2 each independently represent a hydrogen atom or a substituent.

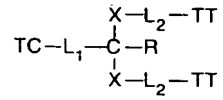
5. The dendron according to claim 1, wherein, in formula (I), R represents a hydrogen atom, an alkyl group, an aryl group, a heteroaryl group, or a group $-X-L_2-TT$, each of which may have a substituent.

6. The dendron according to claim 1, wherein the number of generations is from 2 to 500.

7. The dendron according to claim 1, whose terminal surface has a functional group selected from a mercapto group, a hydroxyl group, a halogen atom, a hydrazino group, a cyano group, an isocyanato group, an isothiocyanato group, a thiocyanato group, a carboxyl group, a sulfo group, an acyl group, a formyl group, an amino group, an alkenyl group, or an alkynyl group, each of which may be in a protected form.

8. A dendrimer, having, as a recurring unit of each branch, a structure represented by formula (I):

Formula (I)



wherein TC designates a linkage to a former generation in the direction to a core of the dendrimer; TT's each designate a linkage to a next generation in the direction to a terminal of the dendrimer; X represents a divalent group comprised of at least one heteroatom; L_1 and L_2's each independently represent a divalent linking group; R represents a hydrogen atom or a substituent; and in the recurring units, X's may be the same or different, R's may be the same or different, L_1's may be the same or different, and L_2's may be the same or different.

9. The dendrimer according to claim 8, wherein the divalent group represented by X in formula (I) is -S-, -SO-, or $-SO_2-$.

10. The dendrimer according to claim 8, wherein the divalent group represented by X in formula (I) is -S-.

11. The dendrimer according to claim 8, wherein, in formula (I), L_1 and L_2 each independently represent a mere single bond, an alkylene group, an alkenylene group, an alkynylene group, a cycloalkylene group, an arylene group, a heteroarylene group, -O-, -S-, $-P=O(R_1)-$, $-N(R_1)-$, -CO-, -SO-, $-SO_2-$, $-Si(R_1)(R_2)-$, or combination thereof, each of which may have a substituent, in which R_1 and R_2 each independently represent a hydrogen atom or a substituent.

12. The dendrimer according to claim 8, wherein, in formula (I), R represents a hydrogen atom, an alkyl group, an aryl group, a heteroaryl group, or a group $-X-L_2-TT$, each of which may have a substituent.

13. The dendrimer according to claim 8, wherein the number of generations is from 2 to 500.

14. The dendrimer according to claim 8, whose terminal surface has a functional group selected from a mercapto group, a hydroxyl group, a halogen atom, a hydrazino group, a cyano group, an isocyanato group, an isothiocyanato group, a thiocyanato group, a carboxyl group, a sulfo group, an acyl group, a formyl group, an amino group, an alkenyl group, or an alkynyl group, each of which may be in a protected form.

15. A method of producing a dendron, which is a convergent method in which n branches are formed from a gth generation, so as to form a (g+1)th generation, in which n is an integer of 2 to 5 and g is an integer of 1 or more, which comprises the step of:

carrying out a reaction, to form the branches,

the reaction satisfying a relationship of:

$k_1 < k_m$

wherein m is an integer of 2 or more but less than n; k_1 represents a rate of growth reaction from the gth generation to the (g+1)th generation, in which only one branch has grown from the gth generation; and k_m represents a rate of reaction from a structure in which (m-1) branches out of the n branches have grown to a structure in which m branches have grown.

16. The method according to claim 15, wherein the step of forming branches is carried out repeatedly.

17. The method according to claim 15, wherein the reaction rate k_m further satisfy a relationship of:

$$k_{m-1} < k_m < k_n$$

wherein k_{m-1} represents a rate of reaction from a structure in which (m-2) branches out of the n branches have grown to a structure in which (m-1) branches have grown, and k_n represents a rate of reaction from a structure in which (n-1) branches out of the n branches have grown to a structure in which n branches have grown.

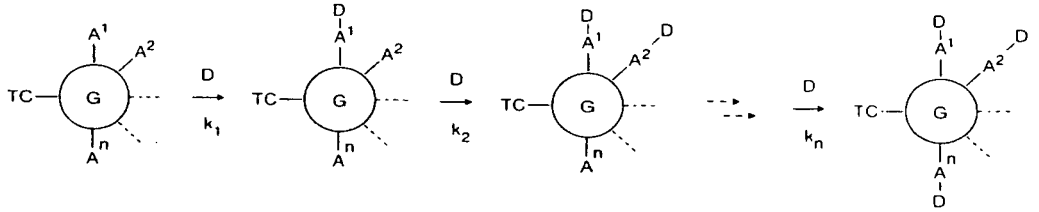
18. The method according to claim 17, wherein the step of forming branches is carried out repeatedly.

19. The method according to claim 15, which satisfies the following condition:

$k_1 < k_2 < \ldots \ldots < k_n$

in a reaction for forming a branch structure of said dendron or dendrimer, as represented by formula (II):

Formula (II)



wherein, in formula (II), TC designates a linkage to a former generation in the direction to a focal point of the dendron, or TC designates a linkage to a former generation in the direction of a core of the dendrimer; G represents a group containing at least one carbon atom; A^1, A^2, ..., and A^n mean that G can form n bonds; n represents an integer of 2 to 5; k_1, k_2, ..., and k_n represent rate constants of respective reactions; and D represents a monovalent group for forming a moiety at a surface terminal side of the dendron or dendrimer.

20. A method of producing a dendron or a dendrimer, comprising:

subjecting a thiol to a reaction with a carbonyl compound or an equivalent thereof, to form a thioacetal, thereby forming a branch structure of said dendron or said dendrimer.

21. A method of producing a thioacetal compound, comprising:

subjecting a thiol compound having in the molecule thereof a thioacetal structure, to a reaction with a carbonyl compound or an equivalent thereof, in the presence of a catalyst, in a reaction solvent selected from ethers, esters, amides, sulfoxides, alcohols, nitriles, and sulfones, thereby to form a thioacetal structure.

22. The method according to claim 21, wherein the solvent is a cyclic ether.

23. The method according to claim 21, wherein the thiol compound having in the molecule thereof a thioacetal structure has at least one thiol group and at least one thioacetal structure represented by R^1-$C(SR^2)_2$-R^3, in which R^1 and R^3 each independently represent a hydrogen atom, an alkyl group, an aryl group, an alkenyl group, an alkynyl group, or a heterocyclic group, provided that R^1 and R^3 are not hydrogen atoms simultaneously; and R^2 is an alkyl group, an aryl group, an alkenyl group, an alkynyl group, or a heterocyclic group.

24. The method according to claim 21, wherein the carbonyl compound is represented by R^4-CO-R^5, in which R^4 and R^5 each independently represent a hydrogen atom, an alkyl group, an aryl group, an alkenyl group, an alkynyl group, or a heterocyclic group, provided that R^4 and R^5 are not hydrogen atoms simultaneously; and wherein the equivalent of the carbonyl compound is represented by R^4-CX_2-R^5, in which R^4 and R^5 have the same meanings as defined in the above; and X_2 is an alkoxy group, an aryloxy group, a heteroaryloxy group, a halogen atom, an imino group, a hydroxyimino group, an alkoxyimino group, a sulfonylimino group, an acylimino group, or an aminoimino group.

25. A method of producing a dendrimer, comprising the step of:
producing a thioacetal structure by the method of producing a thioacetal compound according to claim 21.

26. The method according to claim 25, wherein the solvent is a cyclic ether.

27. A method of producing a dendron, comprising the step of:
producing a thioacetal structure by the method of producing a thioacetal compound according to claim 21.

28. The method according to claim 27, wherein the solvent is a cyclic ether.